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PATENT



SPECIFICATION

*Application Date, Feb. 18, 1918. No. 2836/18.*

*Complete Accepted, Aug. 7, 1919.*

COMPLETE SPECIFICATION.

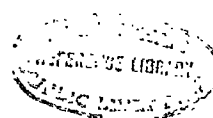
**Improvements in or relating to Pistons for Internal Combustion Engines.**

I, HARRY RALPH RICARDO, Engineer, of 21, Suffolk Street, Pall Mall, London, S.W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 This invention relates to pistons for internal combustion engines of the type in which the purely piston functions are performed by the piston head while all guiding functions are performed by a guide member which is connected to the piston head but so arranged as to enclose the gudgeon pin and has for its object to effect certain improvements in such pistons.
- 10 Experience has shown that piston friction is largely dependent upon the amount of surface in contact with the cylinder walls. The present inventor has designed and employed a piston of the above mentioned type in which the bearing surface of the guide portion or member is reduced by cutting away parts of it so that the guide is constituted by two similar slipper-like parts which pro-
- 15 jected from the head flange. In such a piston the surfaces of the slippers only are in contact with the cylinder walls but even in such a construction the bearing surface is capable of substantial reduction. Such a piston when made of aluminium or aluminium alloy is so light that the pressure on the cylinder walls due to the resolved portion of the inertia load is slight compared with
- 20 that due to fluid pressure which reacts on one side of the piston to a greater extent than on the other.

- According to this invention the flanged piston head is provided with two separate extensions therefrom forming guide slippers of which one has a bearing surface with a greater area than that of the other slipper, the gudgeon pin being disposed between the slippers and carried in bosses formed in webs which
- 25 are connected to the face of the piston head and to the inner sides or lateral edges of the slippers. The slipper which has the lesser bearing surface area is that which lies on the side which takes the thrust on the working stroke of the piston and the webs which carry the gudgeon pin bosses and extend between the face of the piston head and the inner sides or lateral edges of the
- 30 slipper members are formed so that the cross sectional areas of these webs are less towards the slipper of smaller area and greater towards the slipper of greater area. The bosses which carry the gudgeon pin are so placed in the webs that the axis of this pin is set out of the axial centre line of the piston
- 35 towards that slipper whose bearing surface is of less area. By thus reducing the area of one slipper and varying the cross sectional areas of the webs the total weight of the piston is decreased as also the piston friction. By setting

[Price 6d.]



the gudgeon pin out of the centre line of the piston to the extent for example of about three *per cent.* of the diameter of the cylinder the piston is tilted slightly so that the upper portion of the thrust side of the piston is caused to bear on the cylinder wall during the compression stroke and in this way it is prevented from being thrown across from one side of the cylinder to the other 5 when the connecting rod passes over the dead centre under severe pressure at the commencement of the power stroke. In this way noise is obviated while further the angularity of the connecting rod during the power stroke is slightly reduced.

The accompanying drawings illustrate by way of an example an improved 10 piston constructed in accordance with the present invention. In these drawings,

Figure 1 is an elevation of the piston viewed from the side on which is the slipper having the bearing surface of less area.

Figure 2 is a longitudinal section on the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is an underside or end view of the piston.

Figure 5 is a similar underside view showing a modification in the arrangement of the webs.

Like letters indicate like parts throughout the drawings.

The piston head comprises a disc A which is preferably slightly dished and 20 a flange B around this disc the latter being provided with grooves B<sup>1</sup> adapted to carry piston rings. The diameter of the piston head over the flange B is such that it will be an easy fit within the cylinder.

The head flange B is provided with two separate extensions C and D each of which constitutes a curved slipper the two slippers composing that portion 25 of the whole piston which performs the guiding functions. The diameter of this guide when measured across the slippers C and D is such as to be a good sliding fit within the cylinder. The area of the bearing surface of the slipper C is appreciably less than the area of the bearing surface of the slipper D as can readily be seen in Figure 1 the slipper C being not only of less length but 30 also of less width when measured in the circumferential direction than the slipper D. When the piston is in position within the cylinder the slipper C which is of less area is arranged so that it takes the side thrust from the connecting rod on the power stroke of the piston.

The two slippers C and D are carried and connected to the piston head by 35 two similar webs E which in the construction shown in Figures 1 to 4 are parallel and spring from and extend across the disc A of the piston head with which they are formed integral. These webs unite with the slippers C and D on the inner sides thereof and in each web there is formed a boss F adapted to carry the gudgeon pin. These bosses are offset slightly towards the slipper C 40 so that the axis of the gudgeon pin is set out of the axial centre line of the piston towards the slipper C to an extent which approximates to three *per cent.* of the diameter of the cylinder. The cross sectional area of each web E is less towards the slipper C and greater towards the slipper D this being apparent in Figure 2 where the lower edge E<sup>1</sup> of the web E therein shown is inclined from 45 the slipper C towards the slipper D.

Extending across the face of the head disc A and in the plane in which lies the axis of the gudgeon pin is a smaller web G which is formed integral with the disc A and also with the webs E. This web extends to the gudgeon pin bosses F. In the construction shown in Figures 1 to 4 a small transverse 50 web H is also provided across the back of the slipper D this web running between the main webs E and being curved as to its free edge as shown in Figure 4 the ends of the web terminating in the gudgeon pin bosses F. Conveniently a series of holes C<sup>1</sup> and D<sup>1</sup> are formed respectively in the slippers C and D. It is also desirable to provide a series of small holes B<sup>2</sup> for oil drainage through 55 the metal at the juncture between the head flange B and the slippers C and D.

In Figure 5 is shown a somewhat modified construction of the improved

piston which is more particularly adapted for use when the piston is to be made of aluminium or aluminium alloy by means of a die casting process. In this case it will be seen that the two main webs E are not arranged parallel but are inclined to each other and run between the lateral edges of the slipper C and the corresponding lateral edges of the slipper D. In order to simplify the manufacture the small transverse web H is here omitted. The construction is otherwise substantially the same as described above in reference to Figures 1 to 4.

The general and relative dimensions of the slippers C and D may be varied as found desirable the variation in the cross sectional area of the main webs E being modified accordingly.

The above described construction is more particularly adapted for use with pistons formed of aluminium or aluminium alloy but it may also be used in pistons formed of cast iron or other material.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In a piston of the kind described for an internal combustion engine the combination with a flanged piston head, of two separate extensions of the head flange forming guide slippers of which one has a bearing surface with a greater area than that of the other slipper, and a gudgeon pin disposed between the slippers and carried in bosses formed in webs which are connected to the face of the head and to the inner sides or lateral edges of the slippers as set forth.

2. In a piston of the kind described for an internal combustion engine the combination with a flanged piston head, of two slipper members formed as separate extensions of the head flange the area of the bearing surface of that slipper which is on the side which takes the thrust on the working stroke of the piston being greater than the corresponding area of the slipper on the other side, and webs which carry the gudgeon pin bosses and extend between the face of the piston head and the inner sides or lateral edges of the slipper members the cross sectional areas of these webs being less towards the slipper of smaller area and greater towards the slipper of greater area as set forth.

3. In a piston of the kind described for an internal combustion engine the combination with a flanged piston head, of two separate extensions from the head flange forming guide slippers of which one has a bearing surface with a greater area than that of the other slipper, and a gudgeon pin disposed between the slippers and carried in bosses formed in webs connected to the face of the head and to the inner sides or lateral edges of the slippers the axis of the pin being set out of the axial centre line of the piston towards that slipper whose bearing surface is of less area as set forth.

4. The combination and arrangement of parts constituting the complete piston for an internal combustion engine as described and illustrated in Figures 1 to 4 or in Figure 5 of the accompanying drawings.

Dated this 18th day of February, 1918.

KILBURN & STRODE,  
Agents for the Applicant.

[This Drawing is a reproduction of the Original on a reduced scale.]

SHEET 1.

SHEET 2.

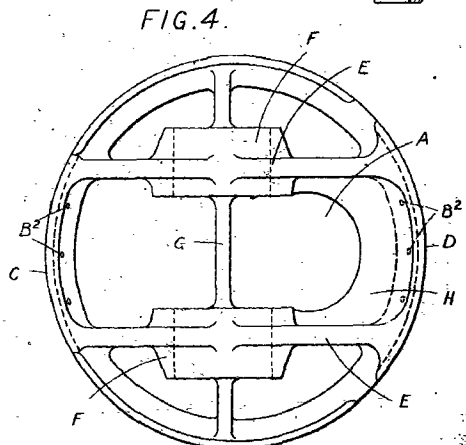
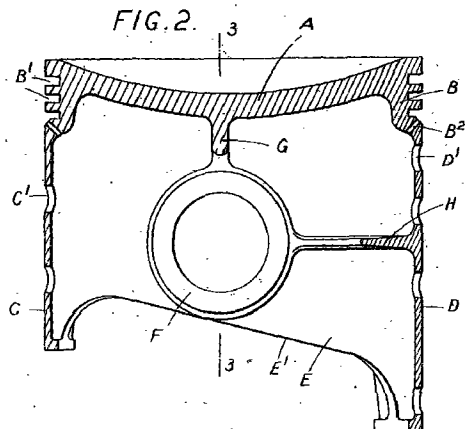
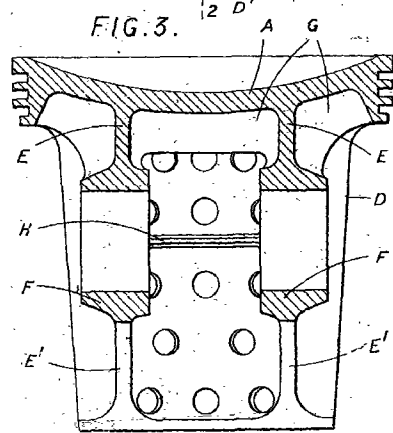
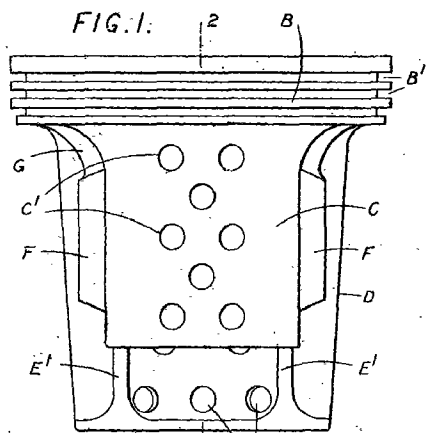


FIG. 1.

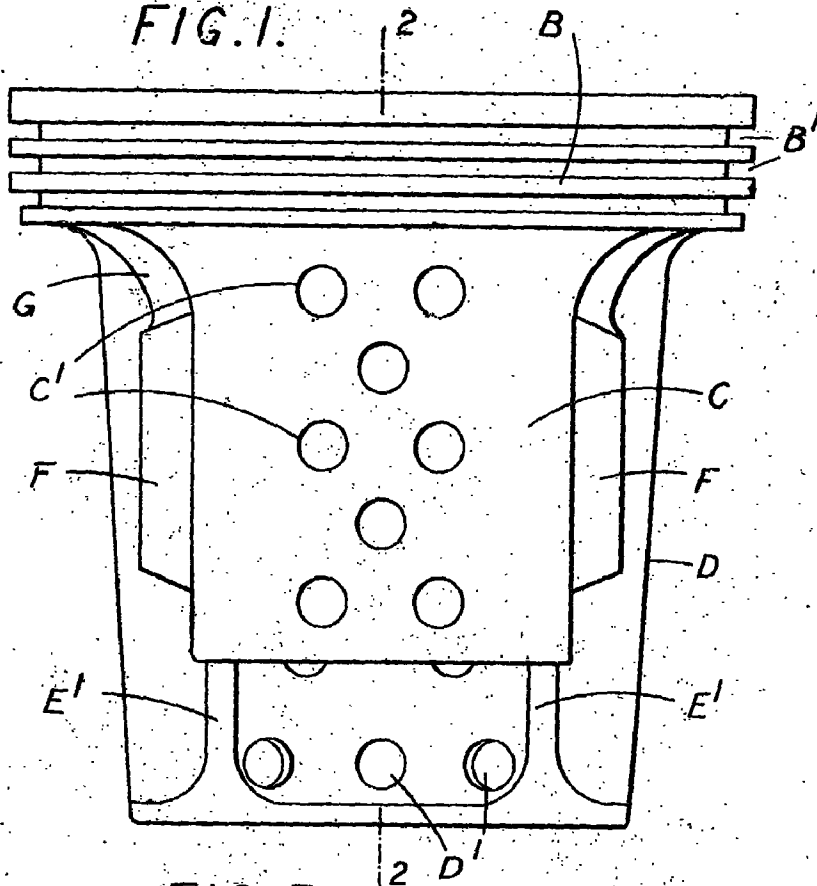
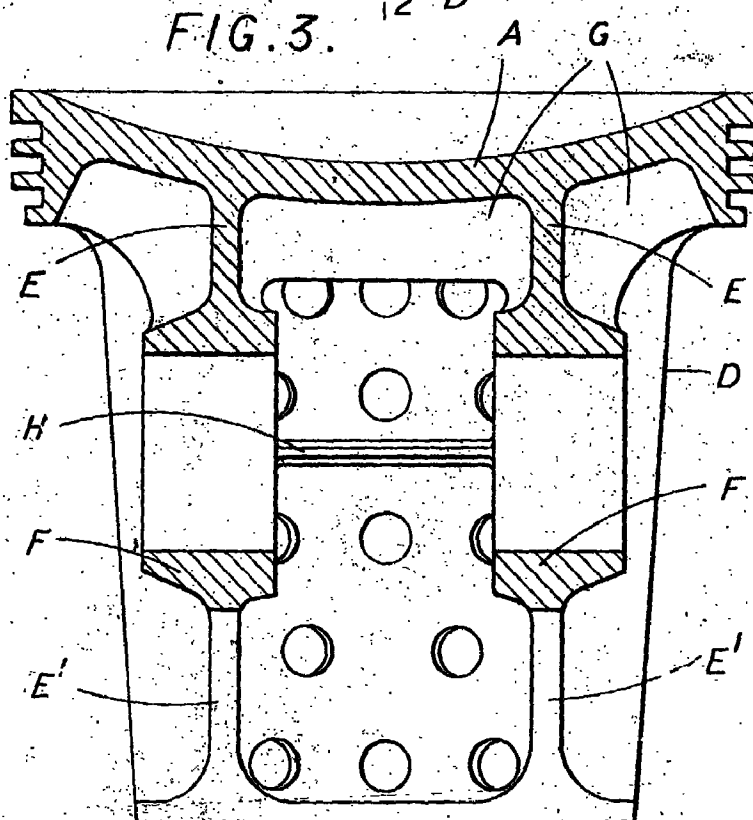


FIG. 3.



[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 2.

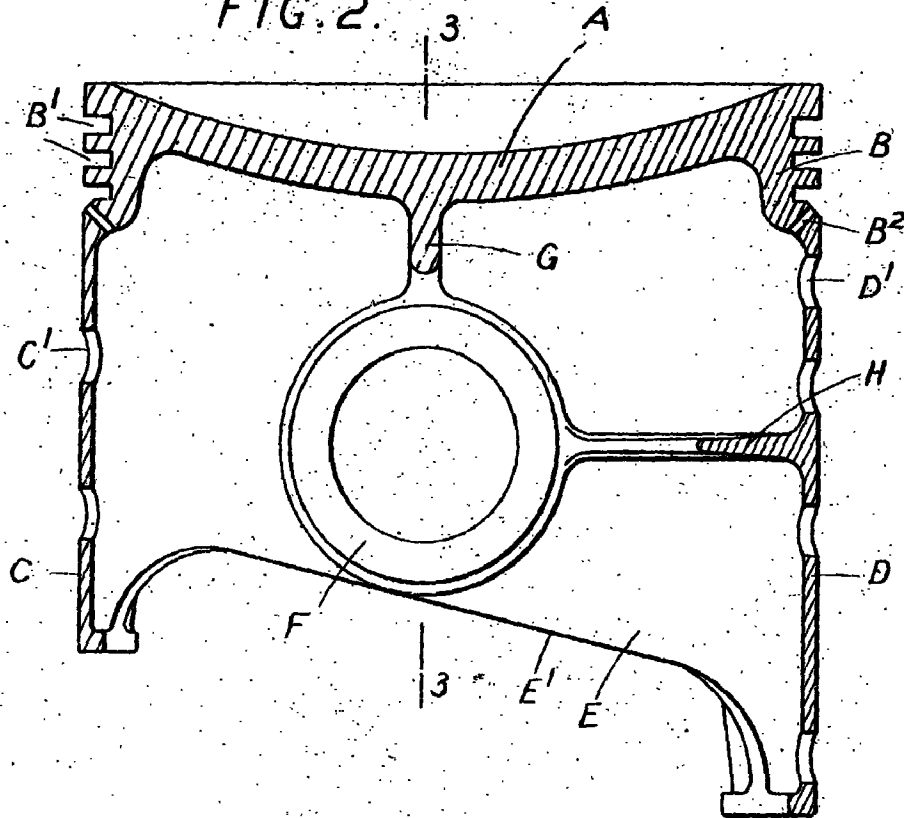


FIG. 4.

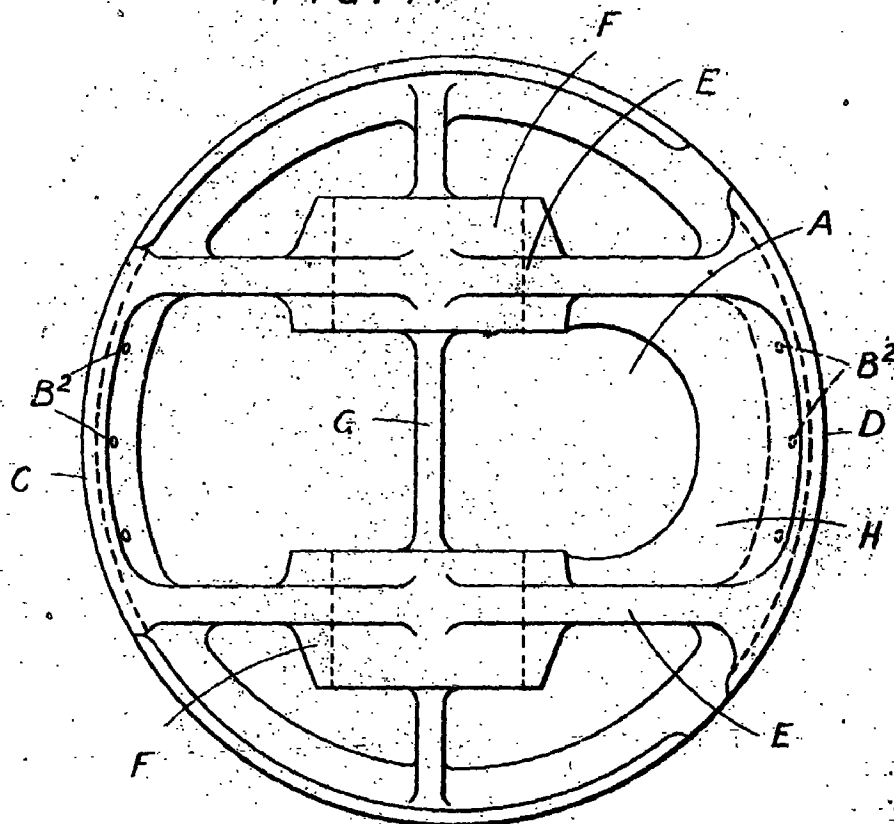
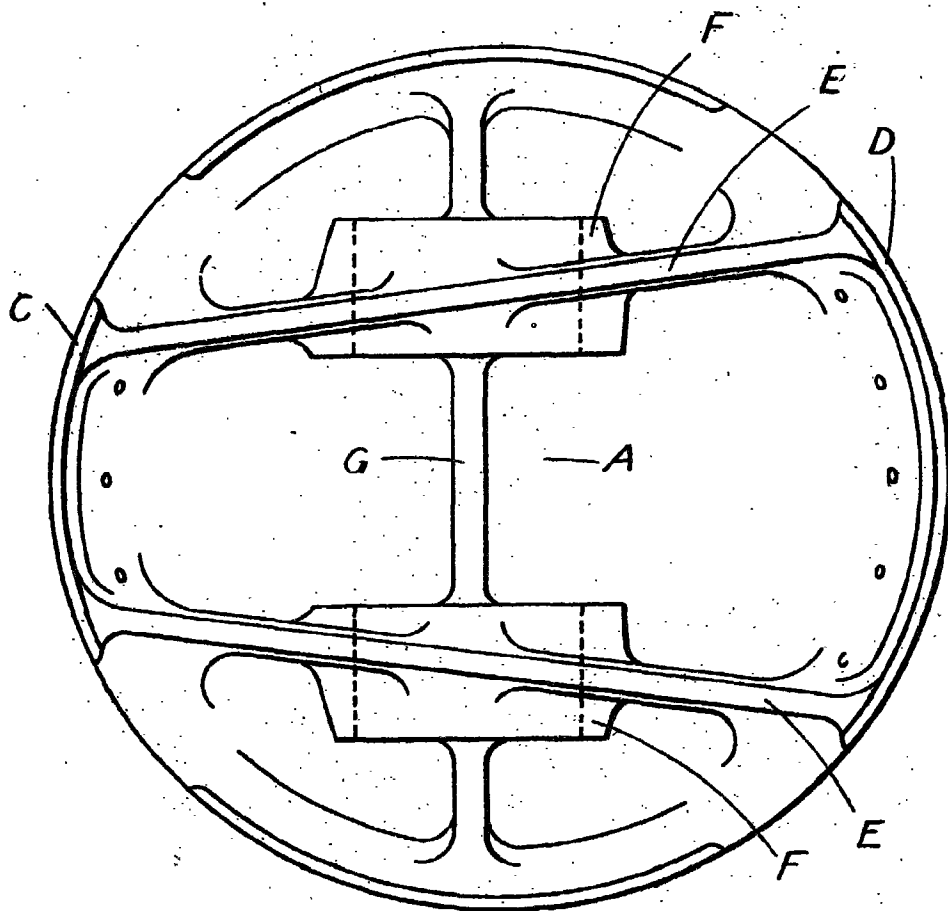


FIG. 5.



[This Drawing is a full-size reproduction of the Original.]

